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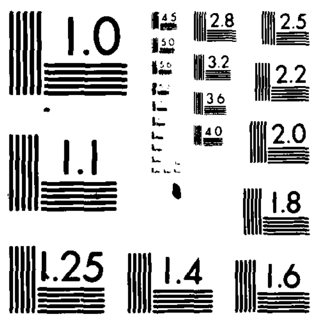

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AN ECONOMIC ANALYSIS OF THE C-130
WING ROTATION CONCEPT TO THE
"VOLANT PINE" OPERATION

Frank Laras, Captain, USAF

LSSR 52-81

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1. REPORT NUMBER LSSR 52-81	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AN ECONOMIC ANALYSIS OF THE C-130 WING ROTATION CONCEPT TO THE "VOLANT PINE" OPERATION		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Frank Laras, Captain, USAF		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS School of Systems and Logistics Air Force Institute of Technology, WPAFB OH		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Department of Communication and Humanities AFIT/LSH, WPAFB OH 45433		12. REPORT DATE September 1981 13. NUMBER OF PAGES 76
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

23 NOV 1981

18. SUPPLEMENTARY NOTES

APPROVED FOR PUBLIC RELEASE AFR 190-17.

Fredric C. Lynch

FREDRIC C. LYNCH, Major, USAF
Director of Public Affairs
Air Force Institute of Technology (ATC)
Wright-Patterson AFB, OH 45433

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

C-130 EUROPEAN ROTATION
VOLANT PINE
TACTICAL AIRLIFT EUROPEAN ROTATION
AIRLIFT DEPLOYMENT/REDEPLOYMENT
C-130 DEPLOYMENT/REDEPLOYMENT
C-130 WING ROTATION

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Thesis Chairman: Thomas C. Harrington, Major, USAF

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

The Military Airlift Command maintains 16 C-130 aircraft in Europe on a rotational basis. This requirement satisfies a U.S. commitment to NATO and provides tactical airlift to U.S. Armed Forces in Europe. Stateside-based C-130 Wings alternate rotating squadrons to Europe for 60-day periods, resulting in 192 C-130 ocean crossings per year. The purpose of this research was to perform an economic analysis of both the existing method of deploying/redeploying C-130 units to Europe, and of an alternative method, the Wing Rotation concept. Under the Wing Rotation concept, a wing would rotate the aircraft once and have all its participating squadrons rotate in succession, with aircrews and support personnel exchanging by C-141 aircraft. The research objective was to select that Wing Rotation alternative which will reduce the present cost of rotating C-130 units to Europe without causing a negative impact on morale. The research product resulted in positive indications that a cost reduction in rotating C-130 units to Europe without impacting negatively on morale is feasible. The author concludes by recommending an alternative which has 96 C-130 and 18 C-141 ocean crossings per year, an overall 30 percent cost reduction over the existing C-130 European Rotation Order.

LSSR 52-81

AN ECONOMIC ANALYSIS OF THE C-130 WING ROTATION CONCEPT TO THE "VOLANT PINE" OPERATION

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Engineering Management

By

Frank Laras, BSME
Captain, USAF

September 1981

This thesis, written by

Captain Frank Laras

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

DATE: 30 September 1981

Thomas C. Harrington
COMMITTEE CHAIRMAN

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation and thanks to the following people. First to my wife, Myrna, and son, Frank Steven, for without the support of my family this research study would have been impossible. To my advisor, Major Thomas C. Harrington, whose professionalism, dedication and encouragement provided me the incentive to produce a thesis of which I am proud.

I also want to thank Lt. Col. Glenn B. Bailey and his staff at HQ MAC/DOOMT for their support in providing me certain data and allowing me the opportunity to do research in the area of C-130 operations.

Finally, a very special thank you is given to Mrs. Phyllis Reynolds for doing an excellent job transforming handwritten material into the final typed thesis.

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CHAPTER I

INTRODUCTION

Background

The Military Airlift Command maintains sixteen C-130 aircraft in Europe on a rotational basis. The rotation concept is basically an exchange of Tactical Airlift Squadrons (TAS), which are permanently stationed in the United States, in Europe for the purpose of supporting the tactical airlift requirements of U.S. and allied forces in that overseas theater. The rotation concept fulfills this objective without requiring permanent aircraft and supporting personnel, since the flight crews, direct support personnel, and aircraft are deployed in a temporary duty status. The temporary duty in Europe is alternated among the TAS units in a system where each squadron succeeds each other, in turn.

History

The history of CONUS-based TAS units rotating to Europe dates as far back as 1962. For a seven-year period from 1962 to 1969, there was a three-squadron combination of C-130s and C-124s involved in the rotation. In 1969, the rotational force was reduced to two C-130 squadrons; one was based at RAF Mildenhall, England, and the second

at Rhein-Main AB, Germany (9:1). Nine C-130 squadrons shared the commitment to rotate to both England and Germany. Three of these squadrons were stationed at each of the following Tactical Airlift Wings (TAW): 314th TAW, Little Rock AFB, AR; 317th TAW, Pope AFB, NC; and 463rd TAW, Dyess AFB, TX. In 1977, the 37 TAS was reactivated with the purpose of being permanently stationed at Rhein-Main AB, Germany. Immediately following, in 1978, the 32 TAS from Little Rock AFB was deactivated. Ever since, the Military Airlift Command (MAC) has maintained eight CONUS-based C-130 squadrons rotating to RAF Mildenhall, England.

Deployment/Redeployment Phase

MAC has the responsibility for providing the Commander in Chief in Europe (CINCEUR) with tactical airlift capabilities. MAC fulfills this commitment by continuous deployments and redeployments of CONUS-based tactical airlift squadrons. The document governing rotational forces is the Commander in Chief of MAC (CINCMAC) Operational Order 11-78 (OPORD 11-78), "VOLANT PINE."

All deployments and redeployments are under the direction of the Numbered Air Forces (21 AF and 22 AF), with 21 AF exercising a final "Go-No Go" authority (2). Both deployments and redeployments are carried out under a staging concept to help move the forces quickly and efficiently to and from Europe. Two staging locations are

presently in use; the primary is Goose Bay, Canada, and the secondary is Lajes, Azores. Twenty First Air Force approves the routing to and from Europe through either Goose Bay or Lajes depending on weather conditions and the minimum flying time expected due to wind direction and velocity at flight altitude. Operational control of rotational forces passes to the Commander in Chief of U.S. Air Forces in Europe (CINCUSAFE) as the aircraft, flying eastward to Europe, pass through 10° West Longitude on deployments, and reverts to MAC at 10° West Longitude when aircraft fly westward from Europe on redeployments (2).

Rotational Squadron Description

The current composition of the rotational squadron is as follows: (9:3):

1. 16 aircraft (C-130)
2. Support equipment for squadron administration and maintenance use, including:
   a. Enroute support kit for staging base
   b. Prepositioned war readiness supply kit at RAF Mildenhall
3. 328 personnel
   a. 15 squadron staff (operation overhead)
   b. 20 aircrews (5 personnel/crew, 1.25 crew/aircraft)

c. 20 extra crew members (mix at squadron commander's option)

d. 193 logistics personnel

Rotational Duty Length

The present system requires a rotational squadron to remain for two calendar months in Europe. The rotational duty is shared among eight eligible squadrons from three CONUS Tactical Airlift Wings (Table 1-1). This equates on the average to a rotation every twelve months for the Little Rock AFB, 314th TAW squadrons, and every eighteen months for the Pope AFB, 317th TAW and Dyess AFB, 463rd TAW squadrons.

TABLE 1-1

ROTATING WINGS AND SQUADRONS

Tactical Airlift Wings	Tactical Airlift Squadrons
314th TAW	50 TAS, 61 TAS
317th TAW	39 TAS, 40 TAS, 41 TAS
463rd TAW	772 TAS, 773 TAS, 774 TAS

Employment Phase

The employment phase is the primary reason for maintaining rotational squadrons in Europe. The squadrons serve two main purposes; the first is to provide tactical airlift to CINCEUR and the second is to satisfy a U.S. commitment to NATO. In providing airlift for CINCEUR, the

rotational squadron becomes part of the European Theater-assigned forces. CINCUSAFE exercises operational control through MAC's 322nd Airlift Division. Daily management of airlift traffic is controlled and scheduled by the Military Airlift Command Center in Europe (9:4). The commitment to NATO is to provide tactical airlift support to NATO forces in Europe. The requirements for tactical airlift support are satisfied through typical missions such as:

1. European Theater Logistic Support, both regularly scheduled channel missions and Special Airlift Assignment Missions
2. Joint Army-Air Force tactical training and Joint Chiefs of Staff exercise support in Europe
3. Mini-rotations to:
   a. Saudi Arabia (1 aircraft, 2 crews, plus support personnel)
   b. Turkey (2 aircraft, 3 crews, plus support personnel)
   c. Greece (4 aircraft, 4 crews, plus support personnel)

Readiness

MAC's rotational commitment of tactical aircraft forces to Europe provides an environment for exercising readiness capabilities as well as for training. The "VOLANT PINE" rotational operation provides CONUS-based

aircrews with the valuable experience of flying in a new and possibly future hostile environment when they are on missions in the European and Mid-East Theaters.

Experience is also acquired in the field of mobility. Every time a C-130 wing gets tasked for a rotation to Europe, a mobility exercise is generated at the wing. All personnel deploying to Europe on the rotation are processed through a mobility line which includes most wing support functions, such as: Finance, Personnel, Hospital, Chaplain, and Security Police. Launch reliability of the aircraft is maintained throughout the deployment, from departure of the CONUS base, through the staging base, to arrival at final destination in Europe. The "VOLANT PINE" operation continuously exercises the readiness of mobility units, which is a vital factor in rapid deployment of tactical airlift wings.

Under the concept of staging rotational units to Europe, both Goose Bay and Lajes are operationally maintained for the support of the "VOLANT PINE" package. Goose Bay provides an enroute stop for a Northern track route to Europe, and Lajes serves the same purpose for a Southern track route. The importance of maintaining the staging bases in operational status cannot be overemphasized; these bases will become critical in support of any contingency requiring deployment of U.S. Armed Forces to Europe, Africa, or the Mid-East.

Author

The author of this study has had a great amount of experience in the tactical airlift environment to include rotations to Europe. Captain Frank Laras is a former C-130 tactical airlift navigator whose most recent assignment was flying C-130s at Little Rock AFB. Captain Laras has experienced rotations to Europe through the following different phases; flying the aircraft as a crew member, serving as an enroute support crew member at a staging base, and as a squadron mobility officer.

Problem Statement

The United States has a commitment, to both NATO and CINCEUR, to provide the capabilities of tactical airlift support in the European Theater. This requirement is satisfied by Headquarters Military Airlift Command (HQ MAC) continuously maintaining sixteen C-130 aircraft in Europe on a rotational basis. The implementing order is HQ MAC OPORD 11-78 (VOLANT PINE), which tasks the tactical airlift squadrons to provide aircraft, crews, and support personnel for sixty-day European rotations. With today's emphasis on efficient use of DOD budget dollars, the total "VOLANT PINE" package needs to be reevaluated in terms of economizing the operation while minimizing any negative impact on unit morale (5:310).

Scope

The "VOLANT PINE" rotational package has basically three phases; deployment, employment, and redeployment. The deployment phase concerns the movement of the rotational unit from its CONUS base to RAF Mildenhall, England. The employment phase includes all activity in support of NATO and CINCEUR during the rotation tour. The redeployment is the movement of the rotational unit back to its CONUS home base. This research will be limited to the study of the deployment and redeployment phases of the "VOLANT PINE" operation.

Geographical locations which are of interest to this study are: the three bases which rotate C-130s to Europe, Little Rock AFB, Pope AFB, and Dyess AFB; the primary staging base, Goose Bay; the destination in Europe, RAF Mildenhall; and a C-141 operating base, McGuire AFB, NJ.

This research will concentrate on the concept of "Wing Rotations" versus the present system used to deploy and redeploy rotational units. The present system of scheduling units for European rotations involves rotating the responsibility among the eight C-130 squadrons, and alternating wings after each rotation to Europe. For example, a yearly schedule would be similar to that shown in Table 1-2.

TABLE 1-2

EXAMPLE OF A EUROPEAN ROTATION SCHEDULE

Squadron	Tour Length
39 Sq Pope AFB	Jan - Feb
772 Sq Dyess AFB	Mar - Apr
50 Sq Little Rock AFB	May - Jun
40 Sq Pope AFB	Jul - Aug
773 Sq Dyess AFB	Sep - Oct
61 Sq Little Rock AFB	Nov - Dec

Wing Rotation Concept

The Wing Rotation concept would rotate the responsibility for the "VOLANT PINE" operation among the CONUS-based C-130 wings. Under this concept, a wing would rotate the aircraft once and have all participating squadrons of that wing rotate in succession. The squadrons within the wing would exchange to Europe on C-141 Special Assignment Airlift Missions (SAAM). For example, the 317th Wing at Pope AFB would be scheduled to rotate to Europe from the month of January to the month of April. The 39th Squadron would fly the wing's aircraft to Europe. At the end of its tour, C-141 SAAM missions would exchange the 39th personnel with personnel of the 40th Squadron. This would once again occur at the end of the 40th tour, whose personnel would be exchanged with personnel of the 41st Squadron. When the 41st Squadron terminates its tour, it also ends the

responsiblity of the 317th Wing for the "VOLANT PINE" operation. At this point the 41st would redeploy the wing's aircraft to Pope AFB and the 463rd Wing at Dyess AFB would take over the responsibility for the "VOLANT PINE" operation. A yearly schedule under the Wing Rotation concept might look like Table 1-3.

TABLE 1-3

EXAMPLE OF A WING ROTATION SCHEDULE

Wing - Squadrons	Tour Length
Pope AFB--39th, 40th, 41st	Jan-Feb-Mar-Apr
Dyess AFB--772nd, 773rd, 774th	May-Jun-Jul-Aug
Little Rock AFB--50th, 61st	Sep-Oct-Nov-Dec

Objectives

The objective of this research is to perform an economic analysis of the alternatives to the Wing Rotation concept, and determine which alternatives will minimize cost of the "VOLANT PINE" operation. Two subobjectives of the research are to: (1) provide feasible schedules for rotating wings under the alternatives of the Wing Rotation concept so as to avoid a wing rotating in the same season year after year, and (2) attempt to minimize negative impact on morale among rotating units. If these objectives can be realized, the final product will be a recommended alternative, which will reduce the present cost of rotating

C-130 units to Europe without causing a negative impact on unit morale.

Research Question

The following question will be addressed in this research: Is there a cost effective alternative to the present system of rotating C-130 units to Europe that would not have a negative impact on morale?

CHAPTER II

DATA REQUIREMENTS FOR THE ECONOMIC ANALYSIS

Introduction

This chapter presents the methodology used in obtaining the necessary data for the economic analysis of the present system of rotating C-130 units to Europe and for the Wing Rotation alternatives selected for evaluation in this study. Data collection was focused on the following areas of interest; C-130 E/H operation and maintenance costs, C-141 A/B operation and maintenance costs, TDY per diem cost for remaining overnight, military pay rate manpower cost, C-141 SAAM rate cost, and fuel consumption rates for both the C-130 and C-141 aircraft. This chapter is divided into three sections; the first two deal with the data sources needed for the analysis of the present system of rotating units, and the data needed for the analysis of the Wing Rotation alternatives. The last section presents questions which will be used to collect data through structured interviews.

Data Requirements for the Present System

To analyze the cost of the present system of rotating units to Europe, four questions were developed to

guide the collection of accurate data. The questions are as follows:

1. What is the operation and maintenance cost of flying the C-130 aircraft to and from Europe during rotations?

2. What is the fuel consumption during the deployment and redeployment phases?

3. What is the TDY cost for the aircrew and maintenance personnel during the deployment and redeployment phases?

4. What is the cost of manpower days lost due to TDY enroute during deployment and redeployment phases?

To answer questions one and two, the total flying hours for rotating units to and from Europe had to be determined. This was accomplished by obtaining the total ground distance between the home base of the rotating unit and the staging base plus the distance to RAF Mildenhall (MLD), and dividing it by the average ground speed. Computer flight plans from MAC provided the distances between points, and the aircraft technical manuals provided the recommended airspeeds. A "no wind" condition was assumed for this study so that the airspeed could be used as the average ground speed. Therefore, dividing the distances by the aircraft airspeed provided the flying times needed to answer questions one and two. Ten minutes were added to the resulting flying times to compensate for low

airspeeds maintained when aircraft climb to flight altitude. Tables 2-1 and 2-2 present the computed flying times.

Having determined the flying hours, the next step was to obtain the operation and maintenance costs, and the fuel consumption per flying hour for each aircraft. The operation and maintenance costs (OM) includes the following (6:2-1): (1) base maintenance supply (BMS), which consists of supplies to be expended in systems support and general support; (2) depot maintenance cost (DM), which includes organic costs such as civilian labor, material expenses, and overhead expenses, as well as contract costs, which include dollar payments to contractors and the dollar value of government furnished material provided to contractors; (3) replenishment spares (RS), which are items that are repaired when their cost of repair is 65 percent or less of the acquisition cost; and (4) the fuel factor, which represents the consumption factor priced out at $1.16 per gallon. The fuel consumption figure used in this study is the same one used for budget and expense purposes (6:2-18). Table 2-3 shows the total OM costs by category, and Table 2-4 indicates the fuel consumption per hour.

The data presented in Tables 2-3 and 2-4 was combined with the total flying hours for the deployment and redeployment of a unit during rotation (Table 2-2) to obtain the OM costs and fuel consumed per unit per rotation.

TABLE 2-1

C-130 FLYING TIME PER AIRCRAFT

C-130E at 280 Kts Airspeed	
Point to Point	Time/Acft
Pope to Goose	5.2 Hrs
Little Rock to Goose	6.5 Hrs
Goose to MLD	8.0 Hrs
C-130H at 300 Kts Airspeed	
Point to Point	Time/Acft
Dyess to Goose	7.5 Hrs
Goose to MLD	7.4 Hrs

TABLE 2-2

C-130 UNIT TOTAL FLYING TIME PER ROTATION

CONUS Base	Deployment to MLD		Redeployment	Total
	Time/Acft	16 Acft/Unit	Same as Deployment	(Hrs)
Pope	13.2 Hrs	211.2 Hrs	211.2 Hrs	422.4
Little Rock	14.5 Hrs	232.0 Hrs	232.0 Hrs	464.0
Dyess	14.9 Hrs	238.4 Hrs	238.4 Hrs	476.8

TABLE 2-3

C-130 OPERATION AND MAINTENANCE COSTS PER FLYING HOUR IN FY 81 DOLLARS (6:2-2)

Acft	BMS Systems	BMS General	DM	RS	Fuel	Total
C-130E	77	73	229	108	918	1,405
C-130H	56	73	229	108	965	1,431

TABLE 2-4

C-130 FUEL CONSUMED PER FLYING HOUR (6:2-17)

Acft	Gals Fuel
C-130E	791
C-130H	832

Table 2-5 presents the combined data which provided the information required to answer questions one and two.

Before the economic analysis of the present system could be accomplished, questions three and four had to be answered. Question three was: "What is the TDY cost for the aircrew and maintenance personnel during the deployment and redeployment phases?" To find the total TDY cost, first the number of TDY days must be obtained and second, the per diem rate must be obtained for the location of interest.

It takes an average of eight days to rotate a unit from the CONUS to England. For the sixteen aircraft

TABLE 2-5

C-130 OM COSTS AND FUEL CONSUMED PER ROTATION

CONUS Base	*Total Flying Hrs	**OM Costs $/ Flying Hr	Total OM Costs $	***Gals/ Flying Hr	Total Gals Consumed
Pope	422.4	1,405	593,472	791	334,118
Little Rock	464.0	1,405	651,920	791	367,024
Dyess	476.8	1,431	682,301	832	396,698

*Table 2-2

**Table 2-3

***Table 2-4

rotation, two aircraft are rotated per day. The first aircraft flys directly to England with the unit command staff. The second aircraft remains at the staging base for seven days with the enroute support team, and then proceeds to England on the eighth day of the deployment. The only personnel involved in TDY at the staging base are the enroute support team and the staging aircrews, which fly the next day's arrivals at the staging base on to England. Total personnel per day staying TDY at the staging base include: a five-member enroute support team aircrew; a maintenance enroute support team consisting of seven personnel; and two staging crews consisting of five aircrew members each. This adds up to twenty-two people TDY per day during the eight days at the staging base. Personnel requirements are the same for the redeployment from England back to the CONUS.

Table 2-6 shows the total number of TDY man days per rotation (note that rotation is abbreviated as "rote" in this and other tables).

TABLE 2-6

TOTAL TDY MAN DAYS PER ROTATION

Personnel	Days	TDY Man Days Deployment	TDY Man Days Redeployment	Total/Rote
22	8	176	176	352

The staging base of interest in this study is Goose Bay AB. The per diem at Goose Bay, Labrador, is $23 per day (8). Table 2-7 transforms the data from Table 2-6 to dollar cost for TDY man days per rotation, thus providing the answer to question number three.

TABLE 2-7

TOTAL STAGING TDY COST PER ROTATION

TDY Man Days	Per Diem/Day	Total $
352*	23	8096

*Table 2-6

The last question to be addressed in order to complete the data collection phase for analyzing the present system was: "What is the cost of manpower days lost due to TDY enroute during deployment and redeployment phases?" Before entering the specifics of the data collection, a

brief explanation of the term "manpower days" is in order. "Manpower days" refers to the days the aircrews and enroute support team spend at the staging base during either the deployment or redeployment phases. This time frame spent staging enroute to the destination base is for the most part idle time which serves no utility to either the rotation base or the CONUS base. Table 2-6 shows there are 352 manpower days spent TDY in the staging phase of a rotation, which could be spent in support of missions either during the rotation or back in the CONUS.

To determine the cost of manpower days the total 352 days TDY per rotation were separated into officer days and enlisted days. Secondly, a daily military pay rate was obtained for both officers and enlisted personnel. Finally, this pay rate was applied to the total officer and enlisted days spent TDY to obtain a total cost for manpower lost during the staging phase of both deployment and redeployment of units.

Each aircrew is composed of three officers and two enlisted personnel. The enroute support maintenance team is composed of seven enlisted personnel. Table 2-6 shows twenty-two personnel remaining TDY per day at the staging base, of which there are three aircrews and the enroute maintenance personnel. Table 2-8 shows the breakdown of officer and enlisted personnel during the staging phase of each rotation.

TABLE 2-8

TOTAL OFFICER AND ENLISTED TDY DAYS PER ROTATION

3 Aircrews/Day		Maintenance Team/Day	Days	Deployment		Redeployment		Total	
Off	En	En		Off	En	Off	En	Off	En
9	6	7	8	72	104	72	104	144	208

To obtain the military pay rates, an average figure was used among the ranks and grades. For officers, an average was obtained from the daily rate between an 0-3 and an 0-2, and for the enlisted personnel, the average rate was obtained from the daily rate between an E-5 and an E-4. The ranks of 0-3, 0-2, E-5 and E-4 were used in this study because they are representative of the majority of personnel involved in rotations. Table 2-9 shows the average values which were used to determine the cost of manpower days lost.

TABLE 2-9

AVERAGE DAILY MILITARY PAY RATE
IN FY 81 DOLLARS (6:3-8)

	03 / E-5	02 / E-4	Average
Officer / Enlisted	116.37 / 56.17	85.21 / 48.99	100.79 / 52.58

Combining the data in Table 2-8 with that of Table 2-9 gives the cost of manpower per officer and enlisted personnel, per rotation. Their sum gives the total cost of manpower, as shown in Table 2-10.

TABLE 2-10

TOTAL COST OF MANPOWER PER ROTATION

	Total Days*	$ Cost/Day**	$ Cost/Rote***
Officer	144	100.79	14,514
Enlisted	208	52.58	10,937
		Total/Rote . . .	$25,451

*Table 2-8

**Table 2-9

***Deployment and Redeployment Phases

Having answered all four questions, the data collection is completed. An economic analysis of the present system of rotating C-130 units to Europe, using this data, is the first step in Chapter III.

Data Requirements for the Wing Rotation Concept

The methodology for obtaining data for the wing rotations is very similar to that used in the previous section for the present system. The difference is that the Wing Rotation concept involves both the C-130 and C-141 aircraft. All the data obtained in the previous section

for C-130 units will remain the same during the analysis of the wing alternatives; therefore, this section will focus on data pertaining to the C-141 aircraft and their respective aircrews.

Basically, the same questions that were developed in the previous section to obtain data, were used in this section because of the common areas of interest. The questions are as follows:

1. What is the operation and maintenance cost of flying the C-141 aircraft to and from Europe during a C-130 unit exchange?

2. What is the fuel consumption during exchanges?

3. What is the TDY cost for the C-141 aircrews during the exchanges?

4. What is the cost of manpower lost due to the length of the TDYs involved in exchanging units?

5. What is the cost of using C-141 SAAMs for the purpose of exchanging C-130 units?

Questions one and two were answered by obtaining the total flying hours it would take a C-141 to fly from its home base, to the C-130 rotating unit's home base, then to Europe and back through the same routing, stopping at the C-130 unit's home base, then on to the C-141's home base. Dividing the ground distance between the points of interest by the average ground speed provided the flying time required for the analysis. MAC computer flight plans

provided both the distances required and the average airspeed. Similar to the C-130 data collection, a "no wind" condition was assumed so that the average airspeed could be used as the average ground speed. Further, ten minutes were again added to the flying time between points to account for the slower airspeeds maintained during aircraft climb to flight altitude. In accordance with AFR 76-11 (7:A1-48), McGuire AFB was selected as the home station for the C-141 aircraft. In addition, it was determined by using airlift planning factors that three C-141 aircraft will be sufficient to transport the personnel and equipment involved with a C-141 unit exchange (4:18). Tables 2-11 and 2-12 consolidate the required flying times.

TABLE 2-11

C-141 FLYING TIME PER AIRCRAFT

C-141 A/B at 425 Kts Airspeed	
	Time/Acft
McGuire to:	
Pope	1.2 Hrs
Little Rock	2.6 Hrs
Dyess	3.7 Hrs
Point to Point	
Pope to MLD	8.4 Hrs
Little Rock to MLD	9.9 Hrs
Dyess to MLD	11.0 Hrs

TABLE 2-12

C-141 TOTAL FLYING TIME PER EXCHANGE

Base	Deployment to MLD Time/Acft	Deployment to MLD 3 Acft/Exchange	Redeployment Same as Deployment	Total (Hrs)
McGuire to Pope	9.6 Hrs	28.8 Hrs	28.8 Hrs	57.6
McGuire to Little Rock	12.5 Hrs	37.5 Hrs	37.5 Hrs	75.0
McGuire to Dyess	14.7 Hrs	44.1 Hrs	44.1 Hrs	88.2

Having established the flying hours per C-130 unit exchange, the next step was to obtain the operation and maintenance costs, and the fuel consumption per flying hour per aircraft. The description given for the C-130 OM costs in the present system remains the same for the C-141 OM costs. Table 2-13 shows the total OM costs by breakdown, and Table 2-14 indicates the fuel consumption for the C-141 aircraft.

TABLE 2-13

C-141 OPERATION AND MAINTENANCE COST
PER FLYING HOUR IN
FY 81 DOLLARS (6:2-3)

Acft	BMS Systems	BMS General	DM	RS	Fuel	Total
C-141A/B	146	103	204	300	2,321	3,074

TABLE 2-14

C-141 FUEL CONSUMED PER FLYING HOUR (6:2-17)

Acft	Gals Fuel
C-141A/B	2001

The data in Tables 2-13 and 2-14 was combined with the total flying hours for exchanging C-130 units via C-141 aircraft (Table 2-12) to obtain the OM costs and fuel consumed per unit exchange. Table 2-15 illustrates the resulting information which answers questions one and two.

TABLE 2-15

C-141 OM COSTS AND FUEL CONSUMED PER EXCHANGE

Exchanging Units	Flying Hours	**OM Costs $/ Flying Hr	Total OM Cost $	***Gals/ Flying Hr	Total Gals Consumed
Pope	57.6	3,074	177,062	2001	115,258
Little Rock	75.0	3,074	230,550	2001	150,075
Dyess	88.2	3,074	271,127	2001	176,488

*Table 2-12

**Table 2-13

***Table 2-14

The next step was to obtain data that will answer question three: "What is the TDY cost for the C-141 aircrews during the exchanges?" To find the total TDY cost, first

the number of TDY days must be obtained and, second, the per diem rate must be obtained for the locations of interest.

When units are being exchanged from Dyess AFB and Little Rock AFB, there will be more TDY involved for the C-141 aircrews than when C-141s are used to exchange Pope AFB units. This is true because of the time involved in flying from point to point, onloading, offloading, and flight planning. MAC restricts basic crews to sixteen-hour duty days; therefore, aircrews will remain overnight (RON) at Little Rock AFB and Dyess AFB throughout the exchanging phase. A basic C-141 crew is composed of four people, two officers and two enlisted personnel. With three aircraft involved per exchange, a total of twelve people will be TDY per RON. Table 2-16 shows the total number of TDY man days per unit exchange.

TABLE 2-16

TOTAL TDY MAN DAYS PER UNIT EXCHANGE

Unit	Personnel	RON CONUS	RON MLD	TDY Days	Total TDY Man Days
Pope	12	-	1	2	24
Little Rock	12	2	1	4	48
Dyess	12	2	1	4	48

The points of interest for which per diem rates are needed are as follows: Pope AFB, Little Rock AFB, Dyess AFB, and RAF Mildenhall. The three C-130 CONUS bases have a per diem rate of $27.00/day, and RAF Mildenhall, England has a per diem rate of $36.00/day (8). Table 2-17 transforms the data from Table 2-16 to dollar cost for TDY man days per unit exchange, and provides the answer to question number three.

TABLE 2-17

TOTAL TDY COST PER UNIT EXCHANGE

	CONUS RON			MLD RON			
Unit	Man Days	Per Diem/ Day	Total	Man Days	Per Diem/ Day	Total	Total Exchange
Pope	-	$27	-	24	$36	$864	$ 864
Little Rock	24	$27	$648	24	$36	$864	$1512
Dyess	24	$27	$648	24	$36	$864	$1512

The next question to answer was: "What is the cost of manpower lost due to the length of the TDYs involved in exchanging units?" To determine this cost, the total number of TDY man days per exchange needed to be separated into officer days and enlisted days. Secondly, a daily military pay rate must be obtained for both officers and enlisted personnel. Finally, this pay rate was applied to the total officer and enlisted days spent TDY to obtain

a total cost for manpower lost during the exchange of C-130 units.

Each C-141 aircrew is composed of two officers and two enlisted personnel. Table 2-16 shows the total number of TDY man days for these personnel per unit exchange. Table 2-18 shows the breakdown for officer and enlisted during the exchanging phase.

TABLE 2-18

TOTAL OFFICER AND ENLISTED TDY DAYS PER EXCHANGE

	3 Aircrews/Day			Total	
	Off	En	Days TDY	Off	En
Pope	6	6	2	12	12
Little Rock	6	6	4	24	24
Dyess	6	6	4	24	24

The military pay rates are the same ones that were determined in answering question four in the data collection for the present system. Referring back to Table 2-9 for the pay rates, and combining this data with Table 2-18, we obtain the cost of manpower per officer and enlisted, per exchange. Their sum gives the total cost of manpower, as shown in Table 2-19.

The final question for this section is: "What is the cost of using C-141 SAAMs for the purpose of exchanging C-130 units?" To answer this question, two items were

TABLE 2-19

TOTAL COST OF MANPOWER PER EXCHANGE

	Total Days*		$ Cost/Day**		$ Cost/Exchange		Total
	Off	En	Off	En	Off	En	Exchange
Pope	12	12	100.79	52.58	1209	631	$1840
Little Rock	24	24	100.79	52.58	2419	1262	$3681
Dyess	24	24	100.79	52.58	2419	1262	$3681

*Table 2-18

**Table 2-9

required; first, the complete routing the C-141 will fly during the exchanging phase and, second, the U.S. Government airlift rates for the respective routings. The route of flight for the C-141 SAAMs will be basically the same for all three locations of C-130 units involved in rotations to Europe. The C-141s will start the exchanging phase from their home base, McGuire AFB. They will fly to the CONUS base of the wing which is presently supporting the "VOLANT PINE" mission, either Pope AFB, Little Rock AFB, or Dyess AFB. From this point, they will fly to RAF Mildenhall, England, for the exchange and return back to the C-130 CONUS base which is in support of the rotation. The exchanging phase ends when the C-141s have returned to McGuire AFB from the C-130 base, or are scheduled to depart from the C-130 base on another SAAM mission.

AFR 76-11 was used to determine the U.S. Government airlift rates for C-141 SAAM missions. The routing used for cost determination was as follows: from New Jersey to either Arkansas, North Carolina, or Texas; then back to New Jersey and across the Atlantic to England. The cost of the return leg from England would be the same as the originating cost to England. Table 2-20 shows the C-141 SAAM rates for the points of interest, and Table 2-21 shows the total SAAM cost for exchanging C-130 units.

TABLE 2-20

SAAM RATES PER C-141 AIRCRAFT (7:A1-38)

From	To / $Cost	To / $Cost	To / $Cost	Total
New Jersey	ARK / 7770	NJ / 7770	England / 28,294	$43,834
	NC / 5094	NJ / 5094		$38,482
	TEX / 11698	NJ / 11698		$51,690

TABLE 2-21

SAAM COSTS PER EXCHANGE

C-130 Base	$ Cost to MLD	Return	3 Aircraft	Total per Exchange
Little Rock AFB	43,834	x 2	x 3	$263,004
Pope AFB	38,482	x 2	x 3	$230,892
Dyess AFB	51,690	x 2	x 3	$310,140

Having answered the last question for this section, the data collection for the economic analysis of the Wing Rotation alternatives is completed. In Chapter III, the data obtained will be used to perform an economic analysis on the Wing Rotation alternatives. Before starting the analysis, there are certain questions of interest presented in the next section which might be determining factors in the conclusion and recommendation of this study.

Interview Questions

Although the purpose of this study is to make an economic evaluation, there are many other factors present besides the dollar cost which would have an impact on selecting an optimum alternative. Through experience of the author it is established that maintenance is a key factor in rotations; for example, size of maintenance squadrons, time to prepare aircraft for long stay away from home base, and reliability of aircraft during extended stay away from home base. A structured interview was devised to help get an idea of some of the limiting factors maintenance would provide in the consideration of a feasible alternative. Interview questions were addressed to the respective maintenance squadrons of the C-130 wings supporting the "VOLANT PINE" mission. The interview included the following questions:

1. For how long can C-130 aircraft be generated to stay in Europe without any major maintenance problems?

2. How many maintenance support teams could your squadron provide for back-to-back wing C-130 unit rotations?

3. If rotation lengths were changed, how would morale be affected?

The above were the three main points of interest which would have a bearing on the length of stay in Europe for both the personnel and the aircraft.

The interview was conducted by telephone. Either the Deputy of Maintenance or the Chief of Maintenance was contacted at each of the C-130 wings (314th, 317th and 463rd), and the three questions were presented. A period of two weeks was allowed before making contact again to obtain feedback on the questions. The purpose for the two-week period was to allow for the questions to reach the individual maintenance shops, thus allowing feedback to come from the line operations. At the end of the two-week period, the feedback to the questions and any other comments were gathered, again by phone interview. As part of the analysis in Chapter III, the results of the interview are presented.

CHAPTER III

ECONOMIC ANALYSIS

Introduction

This chapter presents the economic analysis used in determining the annual costs for the present system of rotating units to Europe, and for the Wing Rotation concept alternatives looked at in this study. The criteria used for comparing the present system with the proposed alternatives is total cost in dollars. To better understand where dollar cost can be saved during the "VOLANT PINE" operation, the total cost was analyzed in two areas. The first area of interest for comparison included SAAM transportation cost and aircraft operation and maintenance costs. The second area was personnel costs, including the TDY per diem and the manpower costs associated with rotating C-130 units to Europe under the present system versus the Wing Rotation alternatives. Following the economic analysis, the results of the interviews will be presented by individual wings, and then summarized for development of recommendations.

To facilitate the presentation of the steps involved in the economic analysis, the data input presented in Chapter II is consolidated in Tables 3-1 and 3-2.

TABLE 3-1

C-130 DATA REQUIREMENTS FOR ANALYSIS

FY 81 Dollars per Rotation				
CONUS BASE	OM Cost	Gals Consumed	TDY Cost-Man Days	Manpower Cost
Pope	$593,472	334,118 Gals	$8096-352	$25,451
Little Rock	$651,920	367,024 Gals	$8096-352	$25,451
Dyess	$682,301	396,698 Gals	$8096-352	$25,451

TABLE 3-2

C-141 DATA REQUIREMENTS FOR ANALYSIS

FY 81 Dollars per Exchange					
CONUS Base	OM Cost	Gals Consumed	SAAM Cost	TDY Cost-Man Days	Manpower Cost
Pope	$177,062	115,258 Gals	$230,892	$ 864-24	$1840
Little Rock	$230,550	150,075 Gals	$263,004	$1512-48	$3681
Dyess	$271,127	176,488 Gals	$310,140	$1512-48	$3681

These tables contain the respective C-130 and C-141 data required to perform the economic analysis of each system.

Economic Analysis of the Present System

The present system of rotating C-130 units to England includes a rotation length of sixty days. The participating C-130 units are scheduled to rotate in sequence by alternating wings after each rotation. A rotation length of sixty days gives six rotations per year, with each wing having two.

Table 3-3 shows a typical rotation schedule for a year, which is the time period selected for this research. By combining this data with that provided in Table 3-1, a determination of the total gallons of fuel consumed and total OM, TDY, and manpower costs can be obtained for the complete year. Table 3-4 illustrates the various computations and yearly expenses.

TABLE 3-3

EXAMPLE OF PRESENT SYSTEM YEARLY ROTATION SCHEDULE

Wing	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pope			39 Sq	39 Sq					40 Sq	40 Sq		
Little Rock	61 Sq	61 Sq					50 Sq	50 Sq				
Dyess					772 Sq	772 Sq					773 Sq	773 Sq

TABLE 3-4

PRESENT SYSTEM YEARLY COST

Expense	Pope	Little Rock	Dyess	Total per Year
OM Cost*	593,472 x 2	651,920 x 2	682,301 x 2	$3,855,386
Gals Consumed*	334,118 x 2	367,024 x 2	396,698 x 2	2,195,680 Gals
TDY Cost		8,096 x 6		$48,576
TDY Man Days		352 x 6		2112 Man Days
Manpower Cost		25,451 x 6		$152,706

*Only OM and Gals Consumed are affected by flying time which varies with location of CONUS-based C-130 unit.

To determine the total cost of the "VOLANT PINE" mission in a single dollar value, the following expense factors need to be considered; the operation and maintenance cost, the manpower cost, and the TDY cost. The sum of these three costs will be the price that is paid to rotate C-130 units to England under the present system. Table 3-5 gives the yearly overall cost of supporting the "VOLANT PINE" mission per year and completes the economic analysis of the present system.

TABLE 3-5

"VOLANT PINE" PRESENT SYSTEM COST PER YEAR

	OM	Manpower	TDY	Total per Year
Present System Cost	$3,855,386	$152,706	$48,576	$4,056,668

Wing Rotation Alternatives and Respective Schedules

The selection of alternatives to be analyzed was constrained in this study by the following rules: (1) squadrons will rotate to Europe for a length of time no less than thirty days; (2) squadrons will rotate to Europe for a length of time no greater than ninety days; (3) rotation lengths will be assigned either by squadrons or by wings for equal time periods; and (4) when rotation lengths are assigned by wings, either all squadrons per wing will rotate

or two squadrons per wing will share equally the rotation length. Table 3-6 shows the alternatives selected for the economic analysis.

The first and most important step in the analysis was to develop a yearly schedule for each Wing Rotation alternative. The schedule provided, on the average, the number of C-130 trips across the Atlantic, and how many C-141 exchanges are needed per year. By obtaining this information, and applying the data from both Tables 3-1 and 3-2, the total cost per year for each alternative was determined. The schedules were also constructed so as to avoid both the repetition of the same wing rotating in the same season consecutively, and the same squadron either deploying or redeploying the wing aircraft. The schedules basically work around the following concept: the first squadron of each wing to rotate will fly the wing's C-130s to England, and the last squadron of the wing to rotate will fly the aircraft back home; all units exchanging in between the first and last squadron will be transported on C-141 SAAM missions. Table 3-7 shows the schedules for each of the alternatives (A through M) from Table 3-6. The schedule for each alternative was constructed in a cycle. Each row in a schedule represents a twelve-month period. At the end of the last year in the cycle, the schedule continues by repeating itself.

TABLE 3-6

ALTERNATIVES FOR WING ROTATION ECONOMIC ANALYSIS

Alternatives	Days Assigned to Either Wing or Squadron*	
Every Squadron Rotates:	Little Rock Wing	Pope and Dyess Wings
A. 30 days	60 days	90 days
B. 45 days	90 days	135 days
C. 60 days	120 days	180 days
D. 75 days	150 days	225 days
Every Wing Rotates:	Little Rock Squadron	Pope and Dyess Squadrons
E. 60 days (30 days/sq)	30 days	30 days
F. 90 days (45 days/sq)	45 days	45 days
G. 90 days (all sqs go)	45 days	30 days
H. 120 days (60 days/sq)	60 days	60 days
I. 120 days (all sqs go)	60 days	40 days
J. 150 days (75 days/sq)	75 days	75 days
K. 150 days (all sqs go)	75 days	50 days
L. 180 days (90 days/sq)	90 days	90 days
M. 180 days (all sqs go)	90 days	60 days

*The difference between Little Rock and both Pope and Dyess is that Little Rock has two operational C-130 squadrons while Pope and Dyess have three each.

TABLE 3-7

ROTATION SCHEDULES FOR WING ROTATION ALTERNATIVES

Wings		Squadrons
Pope AFB -	P	39 - 40 - 41
Little Rock AFB -	L	50 - 61
Dyess AFB -	D	772 - 773 - 774

C-141 Exchange - *

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Each Sq Rotates:												
A. 30 days	L50 *	L61	P39 *	P40 *	P41	D772 *	D773 *	D774 *	L61 *	L50	P40 *	P41 *
	P39	D773 *	D774 *	D772	L50 *	L61	P41 *	P39 *	P40	D774 *	D772 *	D773
B. 45 days	L50	*	L61	P39	*	P40 *	P41	/D	772 *	D773	*	D774
	P40	*	P41 *	P39	/D	773 *	D774	*	D772	L61	*	L50
	D774	*	D772 *	D773	/	L50 *	L61	/	P41 *	P39	*	P40
C. 60 days	L	50 *	L	61	P	39 *	P	40 *	P	41	D	772 *
	D	773 *	D	774	L	61 *	L	50	P	40 *	P	41 *
	P	39	D	773 *	D	774 *	D	772	L	50 *	L	61
	P	41 *	P	39 *	P	40	D	774 *	D	772 *	D	773
D. 75 days	L	50	*	L	61	P	39	*	P	40 *	P	41
	/	D	772 *	D	773	*	D	774	L	61	*	L
	50	P	40	*	P	41 *	P	39	/	D	773 *	D
	774	*	D	772	L	50	*	L	61	P	41	*
	P	39 *	P	40	/	D	774 *	D	772	*	D	773

TABLE 3-7--Continued

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<u>Each Wing Rotates</u>:												
E. 60 days	L50 *	L61	P39 *	P40	D772 *	D773	L61 *	L50	P41 *	P39	D774 *	D772
(30/sq)	P40 *	P41	D773 *	D774	L50 *	L61	P39 *	P40	D772 *	D773	L61 *	L50
	D774 *	D772	L50 *	L61	P41 *	P39	D773 *	D774	L61 *	L50	P40 *	P41
F. 90 days	L50	*	L61	P39	*	P40	D772	*	D773	L61	*	L50
(45/sq)	P41	*	P39	D774	*	D772	L50	*	L61	P40	*	P41
	D773	*	D774	L61	*	L50	P39	*	P40	D772	*	D773
G. 90 days	L50	*	L61	P39 *	P40 *	P41	D772 *	D773 *	D774	L61	*	L50
(all sqs)	P40 *	P41 *	P39	D773 *	D774 *	D772	L50	*	L61	P41 *	P39 *	P40
	D774 *	D772 *	D773	L61	*	L50	P39 *	P40 *	P41	D772 *	D773 *	D774
H. 120 days	L	50 *	L	61	P	39 *	P	40	D	772 *	D	773
(60/sq)	P	41 *	P	39	D	774 *	D	772	L	61 *	L	50
	D	773 *	D	774	L	50 *	L	61	P	40 *	P	41
I. 120 days	L	50 *	L	61	P39 *	P40 *	P41			D772 *	D773 *	D774
(all sqs)	P40 *	P41 *	P39		D773 *	D774 *	D772		L	61 *	L	50
	D774 *	D772 *	D773		L	50 *	L	61		P41 *	P39 *	P40
J. 150 days	L	50	*	L	61	P	39	*	P	40	D	772
(75/sq)	*	D	773	L	61	*	L	50	P	41	*	P
	39	D	774	*	D	772	L	50	*	L	61	P
	40	*	P	41	D	773	*	D	774	L	61	*
	L	50	P	39	*	P	40	D	772	*	D	773

TABLE 3-7--Continued

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
K. 150 days	L	50	*	L	61	P	39 *	P40 *	P	41	D	772 *
(all sqs)	D773 *	D	774	L	61	*	L	50	P	40 *	P41 *	P
	39	D	773 *	D774 *	D	772	L	50	*	L	61	P
	41 *	P39 *	P	40	D	774 *	D772 *	D	773	L	61	*
	L	50	P	39 *	P40 *	P	41	D	772 *	D773 *	D	774
L. 180 days		L50	*		L61			P39	*		P40	
(90/sq)		D772	*		D773			L61	*		L50	
		P41	*		P39			D774	*		D772	
		L50	*		L61			P40	*		P41	
		D773	*		D774			L61	*		L50	
		P39	*		P40			D772	*		D773	
M. 180 days		L50	*		L61		P	39 *	P	40 *	P	41
(all sqs)	D	772 *	D	773 *	D	774		L61	*		L50	
	P	40 *	P	41 *	P	39	D	773 *	D	774 *	D	772
		L50	*		L61		P	41 *	P	39 *	P	40
	D	774 *	D	772 *	D	773		L61	*		L50	
	P	39 *	P	40 *	P	41	D	772 *	D	773 *	D	774

At this point in the analysis, it was necessary to determine the yearly average of C-141 exchanges and C-130 wing rotations. It was also important to associate the exchanges and rotations with the C-130 unit CONUS location, so as to determine the proper cost. After computing the average number of exchanges and rotations per year, the data from Tables 3-1 and 3-2 were applied to determine the average cost per year for each alternative. Table 3-8 shows each alternative with the average wing rotations per year and the average number of C-141 exchanges per year for each CONUS C-130 wing. These figures are obtained by dividing the number of times a wing rotates in a cycle by the number of years in that cycle. For example, in alternative C the average number of both the wing rotations and the C-141 exchanges for Pope AFB is obtained in the following manner. First from Table 3-7 we count the number of times the Pope wing will rotate during the cycle, and thus determine there are three Pope wing rotations. Next, using Table 3-7 again, we obtain the number of C-141 exchanges required by the Pope wing during the cycle, and determine it to be six exchanges. To obtain the yearly average for both the rotations and the exchanges, their respective total number during a cycle is divided by the number of years in the cycle, which for alternative C is four years. Therefore, the yearly average number of wing rotations is three divided by four or .75, and the yearly

TABLE 3-8

WING ROTATIONS AND C-141 EXCHANGES PER YEAR

Alternative	Average Number of Wing Rotes	Average Number of C-141 Exchanges
Each Sq Rotates:		
A. 30 days		
Pope	1.50	3
Little Rock	1.50	1.50
Dyess	1.50	3
B. 45 days		
Pope	1	2
Little Rock	1	1
Dyess	1	2
C. 60 days		
Pope	.75	1.50
Little Rock	.75	.75
Dyess	.75	1.50
D. 75 days		
Pope	.60	1.20
Little Rock	.60	.60
Dyess	.60	1.20
Each Wing Rotates:		
E. 60 days (30/sq)		
Pope	2	2
Little Rock	2	2
Dyess	2	2
F. 90 days (45/sq)		
Pope	1.33	1.33
Little Rock	1.33	1.33
Dyess	1.33	1.33
G. 90 days (All sqs)		
Pope	1.33	2.67
Little Rock	1.33	1.33
Dyess	1.33	2.67

TABLE 3-8--Continued

Alternative	Average Number of Wing Rotes	Average Number of C-141 Exchanges
Each Wing Rotates:		
H. 120 days (60/sq)		
Pope	1	1
Little Rock	1	1
Dyess	1	1
I. 120 days (All sqs)		
Pope	1	2
Little Rock	1	1
Dyess	1	2
J. 150 days (75/sq)		
Pope	.8	.8
Little Rock	.8	.8
Dyess	.8	.8
K. 150 days (All sqs)		
Pope	.8	1.60
Little Rock	.8	.8
Dyess	.8	1.60
L. 180 days (90/sq)		
Pope	.67	.67
Little Rock	.67	.67
Dyess	.67	.67
M. 180 days (All sqs)		
Pope	.67	1.33
Little Rock	.67	.67
Dyess	.67	1.33

average number of C-141 exchanges is six divided by four or 1.50.

Economic Analysis of the Wing Rotation Alternatives

As was previously stated, the data from Tables 3-1, 3-2, and 3-8 were used to compute the total cost per year for each alternative. Table 3-8 gives the average number of rotations and exchanges for each wing per year. The number referring to rotations was multiplied by the data in Table 3-1, and the number referring to exchanges was multiplied by the data in Table 3-2. Adding these two products gave the total cost per year for the use of the C-130s to rotate and C-141s to exchange each wing under each alternative. For a better understanding of how the economic analysis was developed, the first alternative will be used as an example.

Example 3-1. Each Squadron Rotates for 30 Days

From Table 3-8, it is determined that each wing will rotate 1.5 times per year. Table 3-1 shows the cost of flying C-130s per rotation for each wing. By multiplying the costs from Table 3-1 times 1.5, the total C-130 cost is determined, as demonstrated in Table 3-9.

Referring back to Table 3-8, it is determined that both Pope and Dyess will require 3 exchanges, and Little Rock will require 1.5 exchanges per year. Table 3-2

TABLE 3-9

C-130 COST FOR EACH SQUADRON ROTATING 30 DAYS

CONUS Base	$ OM Cost	Wing Rotes/Year	$ Cost/Year
Pope	593,472	x 1.5	890,208
Little Rock	651,920	x 1.5	977,880
Dyess	682,301	x 1.5	1,023,452
TDY Cost	8,096	x 4.5	36,432
Manpower Cost	25,451	x 4.5	114,530
Total Cost			$3,042,502

provides the manpower cost of the aircrew and the SAAM cost, which includes TDY cost for the aircrew and the aircraft operation and maintenance costs. By multiplying these costs by the number of exchanges obtained from Table 3-8, the total cost for using C-141s is determined, as demonstrated in Table 3-10.

Adding the total costs from both Tables 3-9 and 3-10 results in the total cost per year for the alternative in which each squadron rotates for thirty days. Comparing this cost with that of the present system obtained from Table 3-5, it is determined that this alternative is not feasible because it costs more than the present system, as demonstrated by Table 3-11.

The rest of the Wing Rotation alternatives were analyzed in the same manner as illustrated with example 3-1.

TABLE 3-10

C-141 COST FOR EACH SQUADRON ROTATING 30 DAYS

CONUS Base	SAAM Cost $	Exchanges/Year	$ Cost/Year
Pope	230,892	x 3	692,676
Little Rock	263,004	x 1.5	394,506
Dyess	310,140	x 3	930,420
	Manpower Cost $		
Pope	1,840	x 3	5,520
Little Rock	3,681	x 1.5	5,522
Dyess	3,681	x 3	11,043
Total Cost			$2,039,687

TABLE 3-11

ANALYSIS OF EXAMPLE ALTERNATIVE

Alternative: Each Squadron Rotates for 30 Days			
C-130 Cost	C-141 Cost	Total Cost	Present System Cost
$3,042,502	$2,039,687	$5,082,189	$4,056,668
Result: Alternative Cost $1,025,521 More Per Year			

The first step in analyzing the alternatives was to determine the required number of rotations and exchanges from Table 3-8. The second step was to multiply both the rotation and exchange factors obtained from Table 3-8 times the respective cost figures from Tables 3-1 and 3-2. Finally, the result from adding the C-130 rotation cost to the C-141 exchanging cost was compared to the present system's cost. In comparing the total cost of an alternative with that of the present system, it is important to understand what is included in the costs; therefore, a brief review is in order for each cost component. The present system total cost includes the following: (1) C-130 operation and maintenance cost, (2) C-130 aircrew and maintenance team TDY cost, and (3) C-130 aircrew and maintenance team manpower cost. The alternatives' total cost includes the following: (1) C-130 operation and maintenance cost, (2) C-130 aircrew and maintenance team TDY cost, (3) C-130 aircrew and maintenance team manpower cost, (4) C-141 SAAM cost which includes both aircrew TDY cost and aircraft operation and maintenance cost, and (5) C-141 aircrew manpower cost. Table 3-12 summarizes the results of the analysis of each alternative and provides a comparison of the total cost of each alternative with the total cost of the present system under the column titled "Dollars Saved/ Yr."

TABLE 3-12

ECONOMIC ANALYSIS OF WING ROTATION ALTERNATIVES

Present System Total Cost $4,056,668

Alternative	C-130 Rotation Cost	C-141 Exchange Cost	Total Cost	Dollars Saved/Yr
Every Sq Rotates				
A. 30 Days	$3,042,502	$1,908,187	$4,950,689	-
B. 45 Days	$2,028,334	$1,359,791	$3,388,125	$ 668,543
C. 60 Days	$1,521,251	$1,019,843	$2,541,094	$1,515,574
D. 75 Days	$1,217,001	$ 815,875	$2,032,876	$2,023,792
Every Wg Rotates				
60 Days				
E. (30/Sq)	$4,056,668	$1,626,476	$5,683,144	-
90 Days				
F. (45/Sq)	$2,697,684	$1,081,607	$3,779,291	$ 277,377
G. (All Sqs Go)	$2,697,684	$1,813,988	$4,511,672	-
120 Days				
H. (60/Sq)	$2,028,334	$ 813,213	$2,841,547	$1,215,121
I. (All Sqs Go)	$2,028,334	$1,359,791	$3,388,125	$ 668,543
150 Days				
J. (75/Sq)	$1,622,666	$ 650,591	$2,273,257	$1,783,411
K. (All Sqs Go)	$1,622,666	$1,087,832	$2,710,498	$1,346,170
180 Days				
L. (90/Sq)	$1,358,984	$ 544,869	$1,903,853	$2,152,815
M. (All Sqs Go)	$1,358,984	$ 905,594	$2,264,578	$1,792,090

Table 3-12 indicates the total dollar cost of the deploying and redeploying phases of the "VOLANT PINE" operation for both the present system and all of the alternatives selected in this study. For a better understanding of the underlying basis for the cost savings of the proposed alternatives compared to the present system, a breakdown analysis of the total cost was done in the following expense areas; JP-4 consumption, OM costs, TDY days, TDY cost, and manpower cost. The next five tables indicate the savings per expense area for each alternative.

Table 3-13, JP-4 Consumption Per Year, gives the average number of gallons consumed per year for each alternative. Indicated in this table is the amount of fuel now being consumed under the present system, and the amount the C-130s and C-141s will be expected to use under the Wing Rotation concept.

The second table, Table 3-14, Operation and Maintenance Costs, shows the cost to the Air Force for flying the C-130s and C-141s under the present system and Wing Rotation alternatives. In Table 3-14 most of the alternatives show savings in OM costs. This savings represents less wear and tear on the C-130s, and an overall dollar savings in the maintenance cost for the Air Force.

The next two tables deal with the TDY days involved in deploying and redeploying C-130 units to England.

TABLE 3-13

ANALYSIS OF JP-4 CONSUMPTION (GALLONS PER YEAR)

Present System Consumption 2,195,680 Gals					
Alternative		C-130 Gals	C-141 Gals	Total Gals	Gals Saved
Every Sq Rotates					
A.	30 Days	1,646,760	1,100,351	2,747,111	-
B.	45 Days	1,097,840	733,567	1,831,407	364,273
C.	60 Days	823,380	550,175	1,373,555	822,125
D.	75 Days	658,704	440,140	1,098,844	1,096,836
Every Wg Rotates					
	60 Days				
E.	(30/Sq)	2,195,680	883,642	3,079,322	-
	90 Days				
F.	(45/Sq)	1,460,127	587,622	2,047,749	147,931
G.	(All Sqs Go)	1,460,127	978,562	2,438,689	-
	120 Days				
H.	(60/Sq)	1,097,840	441,821	1,539,661	656,019
I.	(All Sqs Go)	1,097,840	733,567	1,831,407	364,273
	150 Days				
J.	(75/Sq)	878,272	353,457	1,231,729	963,951
K.	(All Sqs Go)	878,272	586,854	1,465,126	730,554
	180 Days				
L.	(90/Sq)	735,553	296,020	1,031,573	1,164,107
M.	(All Sqs Go)	735,553	488,572	1,224,125	971,555

TABLE 3-14

ANALYSIS OF OPERATION AND MAINTENANCE COSTS PER YEAR

Present System OM Costs $3,855,386				
Alternative	C-130 OM Cost	C-141 OM Cost	Total OM Cost	Dollars Saved
Every Sq Rotates				
A. 30 Days	$2,891,540	$1,690,392	$4,581,932	-
B. 45 Days	$1,927,693	$1,126,928	$3,054,621	$ 800,765
C. 60 Days	$1,445,770	$ 845,196	$2,290,966	$1,564,420
D. 75 Days	$1,156,616	$ 676,157	$1,832,773	$2,022,613
Every Wg Rotates				
60 Days				
E. (30/Sq)	$3,855,386	$1,357,478	$5,212,864	-
90 Days				
F. (45/Sq)	$2,563,832	$ 902,723	$3,466,555	$ 388,831
G. (All Sqs Go)	$2,563,832	$1,503,296	$4,067,128	-
120 Days				
H. (60/Sq)	$1,927,693	$ 678,739	$2,606,432	$1,248,954
I. (All Sqs Go)	$1,927,693	$1,126,928	$3,054,621	$ 800,765
150 Days				
J. (75/Sq)	$1,542,154	$ 542,991	$2,085,145	$1,770,241
K. (All Sqs Go)	$1,542,154	$ 901,542	$2,443,696	$1,411,690
180 Days				
L. (90/Sq)	$1,291,554	$ 454,755	$1,746,309	$2,109,077
M. (All Sqs Go)	$1,291,554	$ 750,560	$2,042,114	$1,813,272

Table 3-15 shows the actual number of TDY days per year for both the present system and the Wing Rotation alternatives, and Table 3-16 converts these days to dollar costs, which include the per diem paid to the personnel for being on TDY status during the deployment and redeployment phases.

The last table of the breakdown analysis deals with manpower cost. This is basically the cost to the Air Force for employing personnel during the deployment and redeployment phases. The Wing Rotation alternatives cut down on this cost by reducing the amount of time it takes to exchange C-130 units to England. Table 3-17 indicates the dollar cost of the manpower used in the present system and for each Wing Rotation alternative.

In summary, Tables 3-13 through 3-17 help detail how much and where the savings from the alternatives shown in Table 3-12 occur.

Interview Analysis

The methodology used to present the results of the interview questions asked to the C-130 maintenance squadrons representatives is as follows: first, the question is stated; second, the response of each C-130 maintenance squadron representative is indicated separately by wing; and finally, at the end of each question and respective responses, an analysis is made of the data collected from each response and a conclusion stated for the purposes of later, in Chapter IV, formulating a feasible recommendation.

TABLE 3-15

ANALYSIS OF STAGING TDY MAN DAYS PER YEAR*

Present System TDY Man Days 2112 Days				
Alternative	C-130 TDY Man Days	C-141 TDY Man Days	Total TDY Man Days	TDY Man Days Saved
Every Sq Rotates				
A. 30 Days	1584	288	1872	240
B. 45 Days	1056	192	1248	864
C. 60 Days	792	144	936	1176
D. 75 Days	634	115	749	1363
Every Wg Rotates				
60 Days				
E. (30/Sq)	2112	240	2352	-
90 Days				
F. (45/Sq)	1404	160	1564	548
G. (All Sqs Go)	1404	256	1660	452
120 Days				
H. (60/Sq)	1056	120	1176	936
I. (All Sqs Go)	1056	192	1248	864
150 Days				
J. (75/Sq)	845	96	941	1171
K. (All Sqs Go)	845	154	999	1113
180 Days				
L. (90/Sq)	708	80	788	1324
M. (All Sqs Go)	708	128	836	1276

*One man TDY for one day, equals one TDY Man Day.

TABLE 3-16

ANALYSIS OF TDY DOLLAR COST PER YEAR

Present System TDY Cost $48,576

Alternative	C-130 TDY Cost	C-141 TDY Cost	Total TDY Cost	Dollars Saved
Every Sq Rotates				
A. 30 Days	$36,432	$ 9,396	$45,828	$ 2,748
B. 45 Days	$24,288	$ 6,264	$30,552	$18,024
C. 60 Days	$18,216	$ 4,698	$22,914	$25,662
D. 75 Days	$14,573	$ 3,758	$18,331	$30,245
Every Wg Rotates				
60 Days				
E. (30/Sq)	$48,576	$ 7,776	$56,352	-
90 Days				
F. (45/Sq)	$32,303	$ 5,171	$37,474	$11,102
G. (All Sqs Go)	$32,303	$ 8,355	$40,658	$ 7,918
120 Days				
H. (60/Sq)	$24,288	$ 3,888	$28,176	$20,400
I. (All Sqs Go)	$24,288	$ 6,264	$30,552	$18,024
150 Days				
J. (75/Sq)	$19,430	$ 3,110	$22,540	$26,036
K. (All Sqs Go)	$19,430	$ 5,011	$24,441	$24,135
180 Days				
L. (90/Sq)	$16,273	$ 2,605	$18,878	$29,698
M. (All Sqs Go)	$16,273	$ 4,173	$20,446	$28,130

TABLE 3-17

ANALYSIS OF MANPOWER COST PER YEAR

Present System Manpower Cost $152,706				
Alternative	C-130 Manpower Cost	C-141 Manpower Cost	Total Manpower Cost	Dollars Saved
Every Sq Rotates				
A. 30 Days	$114,530	$ 22,085	$136,615	$ 16,091
B. 45 Days	$ 76,353	$ 14,723	$ 91,076	$ 61,630
C. 60 Days	$ 57,265	$ 11,042	$ 68,307	$ 84,399
D. 75 Days	$ 45,812	$ 8,834	$ 54,646	$ 98,060
Every Wg Rotates				
60 Days				
E. (30/Sq)	$152,706	$ 18,404	$171,110	-
90 Days				
F. (45/Sq)	$101,549	$ 12,239	$113,788	$ 38,918
G. (All Sqs Go)	$101,549	$ 19,637	$121,186	$ 31,520
120 Days				
H. (60/Sq)	$ 76,353	$ 9,202	$ 85,555	$ 67,151
I. (All Sqs Go)	$ 76,353	$ 14,723	$ 91,076	$ 61,630
150 Days				
J. (75/Sq)	$ 61,082	$ 7,362	$ 68,444	$ 84,262
K. (All Sqs Go)	$ 61,082	$ 11,778	$ 72,860	$ 79,846
180 Days				
L. (90/Sq)	$ 51,157	$ 6,165	$ 57,322	$ 95,384
M. (All Sqs Go)	$ 51,157	$ 9,809	$ 60,966	$ 91,740

1. Question: For how long can C-130 aircraft be generated to stay in Europe without any major maintenance problems?

Responses: 317th TAW--Aircraft can be generated for a rotation of any length of time. The longer the period of rotation, the longer will be the ground time of the aircraft prior to its departure. The ground time of the aircraft is required to meet all the inspections which will come due during rotation. Ground time does not become a problem for generating aircraft for 120 days or less (1).

463rd TAW--There is no problem in generating aircraft for a rotation length of 120 days. Beyond 120 days inspections become due which would require extra people and aircraft ground time while on rotation (3).

314th TAW--Aircraft can be generated for any specified length of rotation. The longer the rotation the longer will be the ground time in preparation for the rotation because all the inspections must be completed prior to departure. If rotations are extended beyond the present length of time, then additional ground time has to be scheduled for each aircraft in order to be ready to depart on rotation (10).

Conclusion: Aircraft can be generated for any specified length of rotation. If aircraft are generated for a time period greater than the present sixty-day rotation length, extra preparation ground time for each aircraft

will be required in order to cover inspections which come due after the sixty-day interval. The cutoff point for generation seems to be at the 120-day length. Maintenance on the aircraft prior to rotation can cover inspections due up to 120 days. Beyond 120 days additional personnel and aircraft ground time will be required during the rotation to cover the 120-day inspections.

2. Question: How many maintenance support teams could your squadron provide for back-to-back wing C-130 unit rotations?

Responses: 317th TAW--There is no problem in generating two maintenance teams to support a back-to-back C-130 unit rotation. However, three maintenance teams could not be supported (1).

463rd TAW--We would only be able to generate two maintenance teams if exchange operation runs smoothly. There may be a problem in maintenance support if transportation breaks down, since both teams would be at one location and the aircraft at two (3).

314th TAW--We would be able to provide two maintenance teams in support of back-to-back rotations. Maintenance may be slowed down if not at a standstill during the exchange period. Slowdown will come about since deployment personnel will be preparing to depart and redeployment personnel will be on seventy-two-hour time off after arrival (10).

Conclusion: Each wing can provide two maintenance support teams. This would allow for two back-to-back C-130 unit rotations per wing. Since the Pope and Dyess wings would not be able to generate three maintenance teams, it does not seem feasible at this point to rotate all three C-130 units back to back under the Wing Rotation concept. There is a potential for aircraft maintenance to suffer should an aircraft maintenance problem occur during the exchange of the C-130 units. Maintenance activity at the CONUS base will be at a slow pace during the time period the exchanges take place.

3. Question: If rotation lengths were changed, how would morale be affected?

Responses: 317 TAW--Morale would not be a factor unless personnel were to be scheduled for longer than a sixty-day period on rotation. We are very much in favor of back-to-back rotations versus the present system (1).

463rd TAW--Morale should not be hurt if rotation length is not held over the present system (3).

314th TAW--Two sixty-day rotations per year, either back to back or held separately, would not affect morale. Longer rotations would have a negative impact on morale (10).

Conclusion: If personnel are not scheduled for a rotation time period greater than the present system, morale will not be a factor.

The next chapter will focus on both the conclusions of the interview questions and the cost analysis presented in Table 3-12. Combining the comparison of the Wing Rotation alternatives with the availability of resources and maintenance requirements for each C-130 wing will provide an optimum feasible alternative to the present system. The selected alternative will fulfill the objectives of this study by cutting the cost of the "VOLANT PINE" operation while minimizing any negative impact on morale.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this chapter is to present the optimum Wing Rotation alternative, based upon the information provided in Chapter III, and to describe the analysis used in making this decision. In the conclusion section, summaries of the responses from the interview questions are analyzed in conjunction with the results from the economic analysis as presented in Table 3-12. The objective of this analysis was to determine what effects the constraints and present requirements of C-130 support units have on the selection of an alternative. The optimum alternative was then selected subject to these constraints. The recommendations section presents the author's ideas on implementation of the selected alternative.

Before the conclusions and recommendations are discussed, pertinent summary information from Chapter III is presented to facilitate reference to the major findings.

Reference Material From Chapter III

Table 3-6, Alternatives for Wing Rotation Economic Analysis, and Table 3-12, Economic Analysis of Wing Rotation Alternatives, are presented here as Tables 4-1 and 4-2.

TABLE 4-1

ALTERNATIVES FOR WING ROTATION ECONOMIC ANALYSIS

Alternatives	Days Assigned to Either Wing or Squadron*	
Every Squadron Rotates:	Little Rock Wing	Pope and Dyess Wings
A. 30 days	60 days	90 days
B. 45 days	90 days	135 days
C. 60 days	120 days	180 days
D. 75 days	150 days	225 days
Every Wing Rotates:	Little Rock Squadron	Pope and Dyess Squadrons
E. 60 days (30 days/sq)	30 days	30 days
F. 90 days (45 days/sq)	45 days	45 days
G. 90 days (all sqs go)	45 days	30 days
H. 120 days (60 days/sq)	60 days	60 days
I. 120 days (all sqs go)	60 days	40 days
J. 150 days (75 days/sq)	75 days	75 days
K. 150 days (all sqs go)	75 days	50 days
L. 180 days (90 days/sq)	90 days	90 days
M. 180 days (all sqs go)	90 days	60 days

*The difference between Little Rock and both Pope and Dyess is that Little Rock has two operational C-130 squadrons while Pope and Dyess have three each.

TABLE 4-2

ECONOMIC ANALYSIS OF WING ROTATION ALTERNATIVES

Alternative	C-130 Rotation Cost	C-141 Exchange Cost	Total Cost	Dollars Saved/Yr
Present System Total Cost $4,056,668				
Every Sq Rotates				
A. 30 Days	$3,042,502	$1,908,187	$4,950,689	-
B. 45 Days	$2,028,334	$1,359,791	$3,388,125	$ 668,543
C. 60 Days	$1,521,251	$1,019,843	$2,541,094	$1,515,574
D. 75 Days	$1,217,001	$ 815,875	$2,032,876	$2,023,792
Every Wg Rotates				
60 Days				
E. (30/Sq)	$4,056,668	$1,626,476	$5,683,144	-
90 Days				
F. (45/Sq)	$2,697,684	$1,081,607	$3,779,291	$ 277,377
G. (All Sqs Go)	$2,697,684	$1,813,988	$4,511,672	-
120 Days				
H. (60/Sq)	$2,028,334	$ 813,213	$2,841,547	$1,215,121
I. (All Sqs Go)	$2,028,334	$1,359,791	$3,388,125	$ 668,543
150 Days				
J. (75/Sq)	$1,622,666	$ 650,591	$2,273,257	$1,783,411
K. (All Sqs Go)	$1,622,666	$1,087,832	$2,710,498	$1,346,170
180 Days				
L. (90/Sq)	$1,358,984	$ 544,869	$1,903,853	$2,152,815
M. (All Sqs Go)	$1,358,984	$ 905,594	$2,264,578	$1,792,090

Questions and conclusions from the interview are presented in the following section.

Survey Conclusions

1. Question: For how long can C-130 aircraft be generated to stay in Europe without any major maintenance problems?

Conclusion: Aircraft can be generated for any specified length of rotation. If aircraft are generated for a time period greater than the present sixty-day rotation length, extra preparation ground time for each aircraft will be required in order to cover inspections which come due after the sixty-day interval. The cutoff point for generation seems to be at the 120-day length. Maintenance on the aircraft prior to rotation can cover inspections due up to 120 days. Beyond 120 days additional personnel and aircraft ground time will be required during the rotation to cover the 120-day inspections.

2. Question: How many maintenance support teams could your squadron provide for back-to-back wing C-130 unit rotations?

Conclusion: Each wing can provide two maintenance support teams. This would allow for two back-to-back C-130 unit rotations per wing. Since the Pope and Dyess wings would not be able to generate three maintenance teams, it does not seem feasible at this point to rotate

all three C-130 units back to back under the Wing Rotation concept. There is a potential for aircraft maintenance to suffer should an aircraft maintenance problem occur during the exchange of C-130 units. Maintenance activity at the CONUS base will be at a slow pace during the time period the exchanges take place.

3. Question: If rotation lengths were changed, how would morale be affected?

Conclusion: If personnel are not scheduled for a rotation time period greater than the present system, morale will not be a factor.

Conclusions

The first conclusion is from the economic analysis as summarized in Table 4-2, and is that certain alternatives can be eliminated from a cost standpoint. These alternatives are A, E, and G. They are infeasible alternatives due to the fact that their selection would cost the Air Force more money than the present system.

The second conclusion is from the responses to survey question one: there is no problem generating aircraft for a time period up to a 120-day rotation. Any rotation above 120 days would require extra personnel to go on rotation and aircraft would require extra ground time while on rotation. Therefore, it is concluded that any alternative requiring aircraft to remain on rotation over

120 days is infeasible at this time. This eliminates alternatives B, C, D, J, K, L, and M.

The responses to survey question two suggest a restriction on the selection criteria. The conclusion is that each wing can provide a maximum of two maintenance teams to support back-to-back rotations, therefore limiting the number of back-to-back rotations to a maximum of two. This eliminates alternatives A, B, C, D, G, I, K, and M.

The fourth conclusion, taken from the responses to survey question three, is that in order to avoid any negative impact on morale, rotation lengths per unit should remain at sixty days or less. Therefore, any alternatives requiring a C-130 unit to remain on rotation over sixty days is considered infeasible. This eliminates alternatives, D, J, K, L, and M.

The above information is summarized in Table 4-3 in order to present a clear picture of where each alternative failed to meet the selection criteria. The alternatives are presented by respective letter codes designated in Table 4-1. A checkmark under the letter indicates the reason why the alternative was considered infeasible.

The final conclusion is that there are only two alternatives which meet the selection criteria. These are summarized as follows:

TABLE 4-3

ALTERNATIVES VERSUS SELECTION CRITERIA

	Alternatives from Table 4-1												
Infeasible Due To	A	B	C	D	E	F	G	H	I	J	K	L	M
Higher Cost	✓				✓		✓						
Over 120-Day Rote		✓	✓	✓						✓	✓	✓	✓
3 Back-to-Back Rotes	✓	✓	✓	✓			✓		✓		✓		✓
Personnel Over 60 Days				✓						✓	✓	✓	✓

1. The alternative must be less expensive than the present system of rotating C-130 units to England.

2. Aircraft must not remain on rotation for a period of over 120 days.

3. There can only be two back-to-back C-130 unit rotations per wing.

4. Personnel will not be scheduled for rotations of over sixty days in length.

The alternatives meeting the above criteria are F and H.

Alternative F is that each wing be assigned a rotation length of ninety days, in which two squadrons would participate in the rotation at a length of forty-five days each. Alternative H is similar to F except for the fact that each wing would be assigned a rotation length of 120 days and each squadron would have a length of rotation of sixty days each.

Recommendations

It is recommended that alternative H to the Wing Rotation concept be implemented in place of the present method of carrying out the "VOLANT PINE" operation. Alternative H is where each of the three C-130 wings would rotate to England for a period of 120 days. Each wing would have two of its C-130 squadrons share the rotation at a length of sixty days each. The first squadron would fly the wing's C-130s to England and redeploy at the end of the first sixty-day period on C-141 SAAM missions. The second squadron would deploy on C-141 SAAM missions and at the end of the second sixty-day period fly the wing's C-130s back home. Each wing would rotate once a year following the schedule as shown under alternative H, Table 3-7. Little Rock AFB squadrons will rotate on the average of once every twelve months. Pope AFB and Dyess AFB squadrons will rotate on the average of once every eighteen months. This alternative will save the Air Force an estimated 1.2 million dollars per year. It is important to note that alternative H results in a savings of an estimated 656,019 gallons of JP-4 when compared to the present rotation system. This savings in aviation fuel represents a substantial part of the $1.2 million cost avoidance, and can be equated to 810 hours of C-130 flying time or 330 hours of C-141 flying time. This savings would therefore afford the Military Airlift Command the opportunity to save

the fuel and avoid the associated costs, or to use the fuel in support of new flying hour programs.

The remaining portion of the 1.2 million dollar savings comes from shortening the length of time it takes to exchange C-130 units to Europe. Alternative H will produce a savings of 936 TDY man days per year. This savings represents cuts in TDY per diem and manpower costs over the present system but, more important, it will produce 936 extra manpower work days to be used among the C-130 aircrew and maintenance force.

It is noted that the present system of rotation maintains C-130 unit personnel in Europe for a stay of sixty days. The recommended alternative should not impact morale because it does not alter the length of stay in Europe. Under alternative H each wing rotates for 120 days, but each squadron and maintenance team will remain for a period of sixty days. Therefore, the author concludes there will be no change in the morale of personnel under the recommended alternative.

Implementation should be accomplished by testing alternative H to the Wing Rotation concept with one wing; and closely studying the C-141 exchange operation to search for limiting factors and problem areas. For a true evaluation of the system, alternative H should be implemented for a minimum period of one year in order to allow each wing to experience the back-to-back rotation and the exchange

by C-141s. Lessons learned from the first wing's rotation and exchange operation should be incorporated into the concept of operations prior to the rotation and exchange of the second and third wings. After implementation, an important recommendation is a follow-up study to verify all the objectives and criteria have been satisfied. As selection criteria change different alternatives can prove to be optimum.

Finally, in light of the assumptions made and future uncertainties, further study in this area is suggested. Specifically, the author recommends that as fuel and other cost factors change, additional economic analysis be performed following the methodology prescribed in this research. It is noted however, that continued inflation of the economy would increase the cost factors of this economic analysis, resulting in an increase in savings of the alternative over the present system of rotation. Furthermore, a survey of the aircrew members involved in C-130 rotations is recommended. This may prove useful in developing criteria which have not been taken into account in this study.

Summary

In conclusion, the economic analysis along with the interview information was used to determine the optimum alternative under the Wing Rotation concept of rotating

C-130 units to Europe. The recommended alternative results in an estimated 1.2 million dollar savings; an approximate 30 percent reduction in cost when compared to the current method of C-130 unit rotations. If the Wing Rotation concept of exchanging C-130 units proves effective, it will not only be beneficial due to the dollars saved now, but most important as a precedent for exchanging C-130 crews and support personnel to overseas air bases under a national emergency.

SELECTED BIBLIOGRAPHY

A. REFERENCES CITED

1. Boright, Chief Master Sergeant, USAF. Deputy of Maintenance, 317th Aircraft Maintenance Squadron, 317th TAW (MAC), Pope AFB NC. Telephone interview. 4 May 1981.

2. Fine, Major, USAF. HQ MAC/DOOMT. Point Paper, subject: VOLANT PINE Rotation of Tactical Airlift Squadrons to Europe, 8 August 1980.

3. Sounders, Lieutenant Colonel Charles, USAF. Deputy of Maintenance, 463rd Aircraft Maintenance Squadron, 463rd TAW (MAC), Dyess AFB TX. Telephone interview, 7 May 1981.

4. U.S. Department of the Air Force. Airlift Planning Factors. AFR 76-2. Table A1-10, "C-141A Aircraft Performance Data." Washington: Government Printing Office, 11 June 1979.

5. ________. C-130 European Rotation Order. Air University Compendium of Research Topics, Volume I. The Division of Evaluation and Research, Headquarters Air University (ATC), Maxwell AFB AL, 1980-81.

6. ________. USAF Cost and Planning Factors Regulation. AFR 173-13. Chapter 2: "Logistics Factors." Washington: Government Printing Office, 1 February 1981.

7. ________. U.S. Government Airlift Rates. AFR 76-11, Section IV: "Special Assignment Airlift Missions." Washington: Government Printing Office, 25 September 1980.

8. U.S. Department of Defense. Joint Travel Regulation, Volume I, paragraph M4205 and M4253 Appendix A. Washington: Government Printing Office, April 1981.

9. VOLANT PINE. Briefing Manuscript from VOLANT PINE information package. HQ MAC/DOOMT, Scott AFB IL. Received December 1980.

10. Welbourn, Lieutenant Colonel Lawrence, USAF. Deputy of Maintenance, 314th Aircraft Maintenance Squadron, 314th TAW (MAC), Little Rock AFB AR. Telephone interview. 11 May 1981.

B. RELATED SOURCES

Bailey, Lieutenant Colonel Glenn B., USAF. HQ MAC/DOOMT. Point Paper, subject: C-130 European Rote Option, 5 June 1980.

Hoybach, Major, USAF. HQ MAC/DOOMT. Point Paper, subject: C-130 Rotation to Europe, 6 February 1980.

Phillips, Colonel Thomas A., USAF. Director of Airlift Operations. Briefing Manuscript, subject: VOLANT PINE European Rotation Length and Concept, 22 November 1977.

U.S. Department of the Air Force. Special Assignment Airlift Missions. MM 55-2. Washington: Government Printing Office, 10 January 1969.

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Captain Frank Laras was commissioned in 1974 after graduating with a Bachelor of Science in Mechanical Engineering from the University of Puerto Rico. From Undergraduate Navigator Training he was assigned to C-130s at Little Rock AFB, Arkansas. He has served in the Military Airlift Command as a Navigator, Instructor Navigator, Standardization/Evaluation Navigator, and Flight Mission Commander. Captain Laras' additional squadron duties included; Mobility Officer, Disaster Preparedness Officer, Athletic Officer, and Navigator Scheduler. Special crew qualifications Captain Laras held were as follows; Special Operations Low Level (SOLL), High Altitude Low Opening (HALO), Serial Formation Lead, and Grid Navigation. His next assignment after graduation is to Tyndall AFB, Florida, where he will work in the Air Force Engineering and Service Center as the head of the Air Force Air Installation Compatible Use Zone Program.

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